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WELLINGTON BRINK
EDITOR

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SOIL CONSERVATION

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A poor drainage ditch caused this flooding in May. A poor crop followed.

FARM DRAINAGE TO INCREASE WARTIME PRODUCTION

BY JOHN G. SUTTON [1]

NOW, AS NEVER BEFORE, we need to examine the agricultural problems on which the Service is working, study the nature of each, and adjust our program with one objective in mind—to help win the war through improved conservation designed especially for increased production.

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A good drain permits use of rich bottom lands formerly too wet to farm.

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Drainage is recognized as one of the conservation practices that will increase agricultural yields rapidly and effectively. Some essential drainage projects are being or will be undertaken. Others that require too long for development, or too large an expenditure of labor, equipment, and materials should be deferred until after the present war emergency.

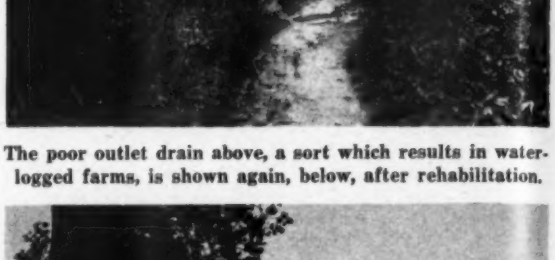
General Drainage Picture

According to information now available, 24,600,000 acres of the lands now in organized drainage enterprises, and 6,400,000 acres outside drainage enterprises are poorly drained and are in need of improved outlet facilities or other rehabilitation and repair work. This 31,000,000 acres of land is limited only to the poorly drained cultivated land having a high inherent fertility and which is now cultivated or partly cultivated. This land does not include any swamp land not already developed into going farm units. The totals mentioned above refer only to land in need of improved outlet drainage. Proper farm drainage is equally important along with outlet drainage systems. Generally the two problems are closely associated, poorly drained lands generally requiring improved farm drains as well as better outlets. Only in a minority of cases will either improved outlets or improved farm drainage, alone, remedy a bad drainage condition.

A large amount of this land in need of improved drainage is in midwestern States, and when properly drained is among some of the most productive land in the world and is capable of producing high returns. Another large amount of this land is located in the southern States. The drainage of this would produce more feed and increase production of beef, milk and pork and also increase production of critical crops such as soybeans and peanuts. There are large acreages of poorly drained land in the South capable of making a contribution to wartime production and helping to solve many post-war problems through improved drainage. Throughout the country improved drainage is especially necessary to the increased production of meat, milk and eggs because flat bottom lands produce such a substantial proportion of feed crops.

Improved drainage is an important conservation measure because drained land is generally the flat land not subject to severe erosion. It is the land most generally adapted to intensive cultivation. An important conservation principle is to encourage maximum use of nonerodible land and to reduce intensity of use of eroding lands.

In general, these drainage problems may be divided into three classes on the basis of an individual job analysis:



The poor outlet drain above, a sort which results in waterlogged farms, is shown again, below, after rehabilitation.

1. Drainage projects essential to the war effort which can and will be financed by farmers and landholders without governmental assistance.

2. Drainage projects not essential to the war effort and which should not be undertaken as wartime projects.

3. Drainage projects essential to the war effort which could be undertaken only with varying degrees of Government assistance.

Farmers and landholders are undertaking to solve and will continue work on problems on their farms which fall within class 1.

Some drainage projects must be submitted to the War Production Board for prior approval, but other jobs are exempt from this requirement. On all operations, applications must be submitted where priority assistance is needed to secure critical construction materials. Excavation requiring no processed materials and tile pipe lines of clay or nonreinforced concrete tile drain not more than 12 inches in internal diameter are exempt from prior approval. Repair and maintenance work is also exempt. Structural work classified as "other restricted construction" must receive prior approval if the job is over $1,000. In case of doubt, information should be secured from the War Production Board.

The Service is especially concerned with the class 3 drainage projects—those essential to the war effort, but which will be undertaken only with varying degrees of Government assistance or encouragement. The AAA program is now allowing payments for drainage work in some States. This is a comparatively recent development following the emphasis on increased production of many agricultural products and it should encourage the improvement of many farm ditches. The soil conservation districts, with the assistance of the Soil Conservation Service, are making good progress in applying farm drainage practices as a part of a complete farm conservation program.

In spite of these encouraging developments there still remains a tremendous acreage of poorly drained agricultural lands. It should be a matter for more general concern and interest that there is such a large amount of poorly drained land which farmers are attempting to farm, and which is yielding a poor return. These conditions result in waste of labor, seed and equipment. Yield of critical crops and agricultural products is much less on such land than if the land now under cultivation were properly drained. By remedying these conditions a substantial contribution toward increased production would result.

To qualify as a wartime project, a drainage project should meet certain requirements. The increase in production resulting from the project should be secured without delay, and to justify the project the ratio of benefit to cost should be high. The primary purpose of the wartime drainage project should be to increase production on lands already in use, or to permit use of land on or near an existing farm unit without expenditures for additional farm equipment and buildings. Reclamation projects requiring development of new farm units should not be undertaken. The principal crops or products grown should be critical to the war effort. The increase in critical crops during the first crop season should compare favorably with the value of critical materials expended on the project.

The availability of labor, equipment, and materials are of fundamental importance. Labor in the vicinity of war production centers and in other areas is very scarce and because of this problem large projects are out of the question. In other areas the farm labor stortage is less acute, especially in the noncrop season. Usually drainage projects should be planned so that operations requiring a large expenditure of labor, such as clearing, will be carried on in the noncrop season. There is much work that farmers can do on their own ditches during the slack periods. Much can be done to stimulate farmer interest in working on drainage improvements.

Drained land is well adapted to the production of corn and other livestock feeds.

Under present conditions it seems improbable that much new equipment will be available for drainage work. This factor, although eliminating many worth-while drainage projects, is not as serious as it may appear. Dragline excavators can be used on most drainage projects. Many contractors will have such equipment available if construction activities of army and naval bases, war factories, flood control projects, roads, etc., should slack off further as appears probable. The possibility that privately owned construction equipment will be available, and that off-season labor can be used to a large degree, are two factors justifying drainage as an important wartime activity.

On those drainage projects meeting requirements for essential wartime activities the engineer should lay aside some of the high standards for peacetime projects and instead design the project for war needs. Fundamentally, the problem is to use a limited amount of labor, equipment and materials, in a manner that will allow maximum production during the next few years. In designing a peacetime drainage project we strive for permanence as well as effectiveness; in wartime we should sacrifice many of the features that make for permanence and even some that would make the project more effective.

The design of each individual drainage project is a problem to be solved by the engineer on the basis of local conditions and requirements; hence, all suggestions given in this article are made with the understanding that the engineer will apply only those that can be classed as "reasonable" according to local conditions.

Victory Ditches

The following principles and methods of reducing expenditures of labor and equipment are suggested for design of drains during the war. (To distinguish such drains from those ordinarily constructed, the term "Victory ditch" is proposed for such wartime jobs.)

The proper capacity, grade, and depth of a ditch should be maintained. Considerable saving can be effected, however, by eliminating smoothing and finishing operations.

In the design of auxiliary structures the engineer should streamline the drainage job for wartime standards. If a bridge must be built, native rough cut logs should be used to the maximum extent. Generally, steel and iron products can be elminated, except nails, cable, and repair parts. Many headwalls and structures to control ditch bank erosion, considered essential during peacetime, must be eliminated as a wartime measure. As a result, ditches will fill up more rapidly and much repair work will be necessary during the post-war period. By digging out inlets recessed from a ditch, erosion can be partially controlled.

Spoil bank leveling with heavy equipment as a special operation is not considered justifiable as a wartime operation. However, leveling a spoil bank by throwing the dirt farther back with an excavating machine and completing the leveling with farm equipment is justifiable if the additional land will result in increased production of critical crops. The extent of seeding and sodding should be decided according to local experience and availability of labor.

As a result of these measures Victory ditches will be less effective and permanent than the well-designed drainage systems which many engineers, including the writer, have long advocated. In the circumstances, however, we must turn to less permanent and even less satisfactory facilities, not without regret and realization of the danger of losing some of the ground gained in a long struggle to secure better standards. We can entertain the conviction, however, that the use of Victory ditches will result in (1) saving of critical materials and labor, and (2) utilization of a limited supply of labor, equipment, and materials in a manner that will benefit most acreages and allow the greatest increase in production.

Even though Victory ditches will be less satisfactory, in order to qualify as wartime jobs they must be planned so that the benefits will be high in relation to costs. Thus, the costs will be repaid rapidly and additional rehabilitation in the post-war period will be justified.

The importance of maintenance must not be overlooked as a wartime activity. Labor should be available during the noncrop season to cut vegetation out of the channels and to perform necessary repair work. Often the effectiveness of a ditch can be improved from 25 to 50 percent by clearing, and perhaps by shoal clean-out, so that major rehabilitation can be postponed. As previously pointed out, improved farm drainage is equally important with improved outlet drainage. These provisions apply equally to farm and community drainage enterprises.

Where tile drains are feasible they provide excellent soil drainage, and should be encouraged to increase production of critical crops. Generally tile drainage operations are carried on by skilled and experienced workers using special equipment and tools. Clay tile and plain concrete tile are not critical materials. Without doubt the acreage benefited by an efficient tile-laying crew justifies that work as a wartime activity. This is especially true when consideration is given to the peculiar soil and crop conditions requiring tile drainage and the specialized skills of tile-laying crews and workers in tile factories. It must be kept in mind that these men, who help many farmers to increase yields of land by 25 to 100 percent, are performing an essential wartime activity in a manner similar to the farmer who increases production by expanding acreage. An increase in yield per acre is even more valuable than an increase in production secured by expanding acreage, because farm production costs are not increased to the same degree. Production costs per unit are much lower on a well-drained field than on a poorly drained

field, especially where the cost of cultivating wet fields, replanting crops, and depreciation of equipment are fully considered.

Because of the permanent nature of tile drains, it appears that only minor changes in design appear justifiable. Standards should be maintained for good alignment, proper grade and depth, and tile should meet usual specifications. Noncritical materials should be used for manholes, headwalls, and other structures. Often headwalls can be postponed until after the war.

Results of Two Drainage Programs

Effective results can be secured through placing adequate resources on drainage operations, as is evident from a brief survey of two drainage programs, one in the United States, the other in England.

Forty-six CCC camps were placed on drainage operations in 1935. From July of that year to December 31, 1941, a total of 12,000,000 acres were benefited by drainage projects upon which the enrollees worked. These projects included: 6,444 miles of ditches excavated, requiring 64,352,000 cubic yards of earth excavation; a total of 340 miles of tile drains rehabilitated, involving placing of a small amount of new pipe. The work was cooperative in nature—drainage districts and farmers contributed $4,627,855.16, nearly all in cash, to the projects. It is indeed fortunate that this work was completed so that the results are fully effective during the war period.

It is estimated that corn can be grown on 40 percent of the land benefited, roughly 5,000,000 acres. The improved outlet facilities and the farm drainage work undertaken by the farmer, resulting from the program, probably increased the corn yields 10 bushels per acre. The total probable increase in corn is therefore around 50,000,000 bushels. If 32,000,000 bushels of this is devoted to hog production it will easily result in 400,000,000 pounds of hogs; and the remainder, 18,000,000 bushels, if devoted to beef cattle will result in over 100,000,000 pounds of beef. Hay yields can be increased about 20 percent on some 2,000,000 acres. The hay and pasture program on the acreage benefited can support the beef and hog production stated above.

Another critical crop benefited by this drainage program included soybeans, with an estimated increase of 5,000,000 bushels on 1,000,000 acres at an average rate of 5 bushels per acre. Also, sugarcane production was increased 4 tons per acre on 75,000 acres or 300,000 tons.

The British Government is giving direct assistance on drainage projects. At the end of 1941 direct subsidies had been approved for 1,300,000 acres of farm drainage schemes. Probably most of this program has now been completed. Approved mole drainage schemes covered 150,000 acres, and the tile drainage projects 90,000 acres. It was estimated that 900 draglines including 400 government owned machines would be operating in the United Kingdom by the end of the year. Two drainage engineers from the Soil Conservation Service—Elmer W. Gain, for-

(Continued on p. 214)

WAR CROPS FROM WASTED ACRES

BY EDWARD H. GRAHAM[1]

ONE OF OUR WARTIME JOBS is to bring speedily into production as many as possible of our so-called "wasted" acres. Some such lands, unsuited to intensive farming, already are contributing food and other products needed in the present emergency. Enough has been done to show how worth while it is to develop every hidden asset of every acre.

Some parcels of land are most economically used when specifically managed for wild crops. Other lands, primarily dedicated to tilled crops, pasture, or woodland can, with slight modification, provide useful wild plants and animals.

What are some of the practices which help to support a country at war and assist us to make maximum use of our land resource without waste of time, labor, materials, and funds?

[1] Chief, Biology Division, Soil Conservation Service, Washington, D. C.

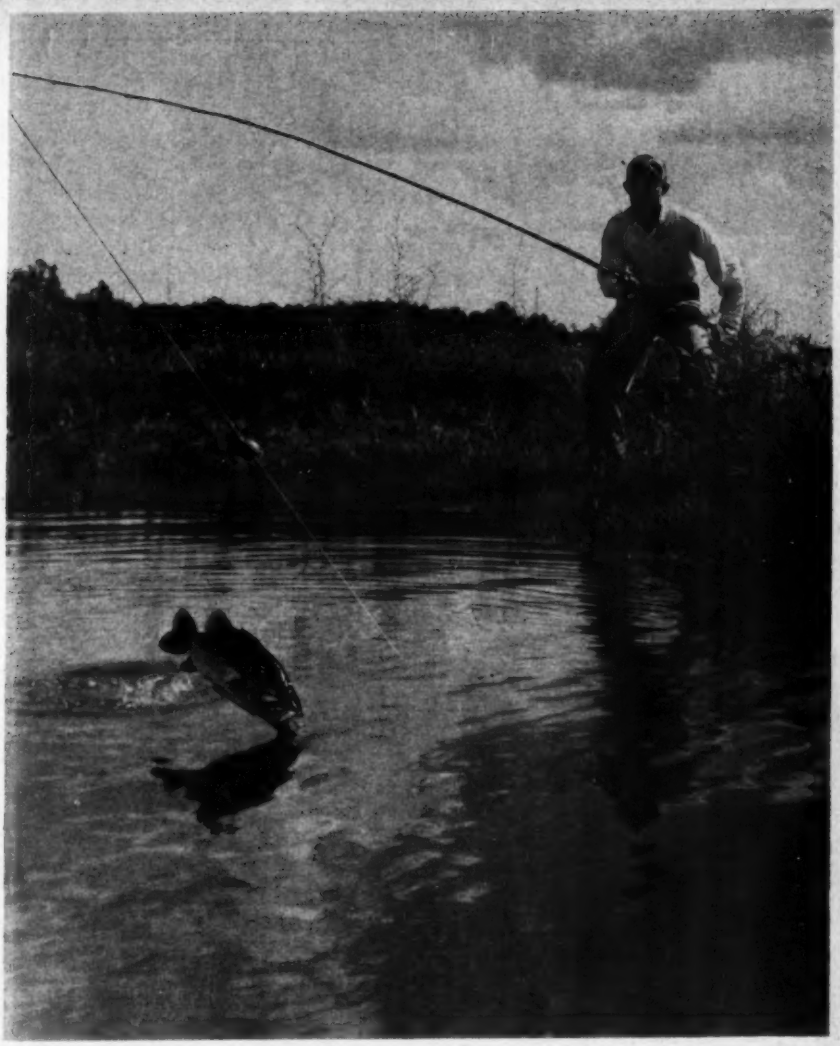
Fish From the Farm Pond

Fish from farm ponds have been contributing materially to the Nation's food production program; with the application of known simple management practices they can produce a great deal more. The farm pond provides water for livestock, a refuge for waterfowl, a home for fur-producing muskrats. It is also as productive of protein and vitamin-rich food, acre for acre, as highly developed livestock pasture. We cannot afford to neglect the potential source of many million pounds of palatable food per year. With "red" meat rationed, every pound of pond fish is a pound of meat to the good. This is all the more important now that our supply of marine food fish has been reduced 22 percent through conditions necessitated by the war.

The raising of pond fish is an old and much-used type of farming in many parts of the world but until recently it received little attention in the United States. Modern methods of pond fish production are based upon the maintenance of a rather easily managed food chain. Ordinary fertilizers are added to the water of the pond to provide nutrient elements. These support microscopic plants that serve as food for minute animals. Water insects feed upon these animals and the microscopic plants. In turn, the insects and small animals—protozoans, rotifers, crustaceans—provide food for forage fish such as the bluegill bream. The forage fish are eaten by carnivorous species, for example, the largemouth bass. Both the bream and bass furnish food for man. The practical marvel of this scheme is that fingerlings stocked last spring will produce bream weighing a quarter-pound and bass weighing a pound apiece next summer. Even a war economy can expect no better production than this.

For the development of this type of fish management, we must take off our hats to the research of H. S. Swingle and E. V. Smith at the Alabama Experiment Station. Their work has shown us productive management methods that can be easily applied. Last year nearly 1,000 farm ponds in soil-conservation districts were carefully stocked with fish obtained from Federal hatcheries as a

Bees increase orchard yields by pollinating fruit tree blooms, and aid in seed production of legumes and other crop plants useful for soil conservation and food production. They provide honey especially valued when other sweets are scarce, and are the only source of beeswax, indispensable for making ammunition grease, pharmaceuticals, and other war materials.



Properly managed farm and ranch ponds provide millions of pounds of food rich in proteins and vitamins—food to supplement rationed "red" meat and replace in part our supply of edible fish which has been reduced 22 percent by war conditions.

result of close cooperation between the Fish and Wildlife Service and the Soil Conservation Service. Several States also gave assistance. These ponds, properly fertilized and managed, will yield per year 200 to 400 pounds of edible fish per surface acre of pond at a cost of from 3 to 6 cents a pound.

How fortunate are Americans to have at their disposal tens of thousands of farm and ranch ponds already constructed and awaiting only slight attention to produce nutritious and tasty food. The London radio tells of housewives standing in line to buy fresh fish for making "fish and chips"; their supply has been severely reduced because English fishing trawlers are needed for mine sweepers. In the United States we eat a great deal of fish. Civilian consumption of fish for food in the United States is shown in the following:

Kind	Yearly average, 1935–39	Estimated 1943
	Pounds	*Pounds*
Fresh and frozen	934,000,000	812,000,000
Cured	185,000,000	132,000,000
Canned (including shellfish)	674,000,000	208,000,000

Much of this is marine fish. It would, however, be practicable to add enough farm and ranch ponds and reservoirs to furnish us with 100,000,000 pounds or more of fresh fish every year. Even our present production will be greatly valued locally, especially in the South where management is most highly developed and the pond fish are most prized for food.

Wild Fruits

All too frequently it is forgotten that wild shrubs which will grow in special sites not able to support

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cultivated crops can provide both food and profit. In the acid bogs of the northern States, cranberries and blueberries offer a source of considerable revenue. Improved varieties of the latter are now available and in 1941 they provided a return of $750,000; but this is a pittance compared with the return from the wild crop. In a good year, huckleberries and blueberries, picked from wild, unimproved stock, provide in the United States the astonishing return of $10,000,000. The wild low-bush blueberry of Maine and the lake States alone provides a return of nearly $5,000,000. Other kinds are highly valued in the East, South, and West. The florists pay to the States of the Pacific Northwest as much as $200,000 annually for the branches of thick, shiny, dark green leaves of the Pacific Coast evergreen blueberry useful for decorative floral effects. The same blueberry provides an annual food crop valued as high as that of the branches.

As a part of the program to control erosion on agricultural land, biologists have recommended the planting of grasses, legumes, and shrubs on gullies, odd spots, field borders, and other eroding areas. Planted as parts of complete farm lay-outs directed at better use of each acre on the farm, shrubs for these small eroded areas—useless for tilled crops, pasture, or woodland—have been selected not only for their erosion control usefulness, but for the wildlife food and cover they provide, and the human food they produce. The wise farmer's wife will not neglect the patch of wild plums, cherries, currants, high-bush cranberries, elderberries, grapes, and other wild fruits growing now on that "worthless" spot down by the creek, for they are the source of delicious preserves, jellies, jams, pies, and sauces. Unlike cultivated shrubs, these wild ones require no pampering, for they are adapted to soil conditions unsuited to more productive use and, once established, will fend for themselves.

The general picture for the United States regarding cultivated fruits may be seen in these figures showing civilian per capita fruit consumption over two periods, and goals for the present year:

	Yearly average, 1935–39	Yearly average, 1941–42	Goals, 1943
	Pounds	*Pounds*	*Pounds*
Fresh citrus	49.9	59.7	65.5
Canned citrus	2.3	5.1	3.4
Fresh fruit	102.2	94.5	77.1
Canned fruit	14.2	17.7	3.7
Canned fruit juice	3.2	5.3	1.9
Dried fruit	6.0	6.7	4.9

Our 1943 supply of many fruits will be reduced because some will go to the armed forces, labor is scarce, and metal and rubber for domestic canning for other than home use are restricted. It thus becomes apparent that in the current year we can expect an appreciable contribution to our supply of fresh fruits from those wild kinds most easily grown for use on the individual farm. Furthermore, the labor required to make use of wild fruits available "at home" is far less than that needed to pick, pack, and distribute most cultivated kinds.

Wild plum, a thicket-producing, erosion-control shrub of great value for wildlife cover, is highly prized for human food. Erosion control operations planned for the coming season call for 502,000 plum seedlings of three species, and many farmers also will seed wild plums directly, a practice which lowers the cost of establishing the plants. Wild cherries to the number of 477,000 will be planted. The western sand cherry is a favorite, for it not only holds soil in sandblow areas but produces a large well-flavored fruit. Many other berries, grapes, hazelnuts and filberts, are numbered among the food producing shrubs planted to hold soil and prevent excess runoff on our farms and ranches.

Soil Conservation Service nurseries have produced 150 million shrub seedlings for establishment on a quarter of a million American farms and ranches as part of erosion-control operations. Others have been seeded directly, and many of them will bear useful fruit next fall. Species of value for human food comprise 30 percent of all the seedlings used.

An indirect use of many shrubs planted on wasted areas is the contribution they make to honey production by providing bees with both nectar and pollen. Not all of us realize that honeybees, the only source of honey and beeswax, produce each year in the United States more than 200 million pounds of honey and 4 million pounds of beeswax. In spite of this large production, we import an additional 4 million pounds of beeswax annually. Beeswax not only has many peacetime uses, but is irreplaceable in time of war for making ammunition grease, models, machine patterns, pharmaceuticals, leather dressings, finishes, and polishes.

Honey is all the more sweet when sugar is scarce. Perhaps the most important contribution of bees, however, is their assistance with seed production through pollination of pasture legumes and other plants useful in conserving soil, and the fertilization of fruit tree flowers. Throughout the country many plants used in our food production and better land use program are valuable bee plants. An example is the shrubby bicolor lespedeza which recently has come into extensive use in the South as the woody element in the field border planting established on eroding margins between crop fields and woodlands. This lespedeza is much used by bees—good honey plants are not abundant in the South—and it fur-

nishes a very light-colored, mild honey. Sweetclover, which grows very well and is extensively used on depleted soils to check erosion, is rated as a top-notch bee plant.

Farm Furs

The environs of the farm pond, the marsh or swamp, stream bank or wood lot, all offer opportunities for the production of farm fur bearers. Since the war, furs used by Americans, usually to the tune of about $120,000,000 each year, have been reduced fully 50 percent, for imports have practically ceased. Furs are not entirely a luxury item, in spite of their great use for high-priced evening wraps; fur coats and mittens are practical and useful articles of clothing in cold parts of our country. Furthermore, furs are used for many garments, for the making of felt, for brushes, ornaments and other items. The making of fur vests for the Merchant Marine today stresses the value of fur for warm, protective clothing, and our men in Alaska, Greenland, and Iceland find fur clothing warm and comfortable.

Although we have on hand an adequate stock of both imported and domestic furs, this supply is not inexhaustible, and tests being made by the Army indicate greater possible use of furs by our fighting forces in cold regions and high altitudes. The farm is a place where some of these needed furs can accrue as a byproduct of ordinary operations. Muskrat, opossum, skunk, raccoon and mink live well on farm land, and even our most intensively cultivated areas can produce a good crop of fur. For example, Iowa, where farm land makes up 95.3 percent of the State's acreage, produces an annual average of 272,000 muskrat pelts, 105,000 skunk skins, and 75,000 oppossum, mink, and raccoon hides. This take is valued at $625,000 per year, and three-fourths of it is produced on less than 4 percent of Iowa's agricultural acreage.

To the farm family there is profit in the managed fur harvest. Although the farmer is busy with the production of staple foods, the farm boy will find time to run a trap line, and many farmers' sons who have made the bulk of their college money that way will attest its benefit. If the experience of the last war is any criterion, the value of farm furs will rise this year and next. During World War I muskrat pelts rose 72 percent in value, and they are likely to bring $1.50 or more before this war is over. Opossum hides rose 150 percent in value during the previous war, striped skunks increased 153 percent, raccoons 190 percent, and mink 9 percent. Some, such as the mink, may not repeat their previous rise, for they are already bringing an average price of more than $5, a figure higher than they brought during the first World War.

Fur bearers can contribute more than their pelts to the war effort, if they are used without waste. Hunters are being urged now to save the bodies of all small mammals killed, so that they may be rendered for glycerine to be used in making explosives. Moreover, fur bearers can provide food. The opossum has long been a favorite food, and in Louisiana muskrat carcasses are being frozen in local storage plants, dressed as "marsh hares" for table use in eastern markets. The flesh is dark colored and well flavored, and the only special treatment required to make the animals entirely fit for food is the removal of the two musk glands. In Louisiana alone, 6,000,000 muskrats are caught anually, providing a potential meat supply equivalent to 6,000 beeves.

Crops and Insects

To protect the crops grown the land management biologist assists land operators to develop management practices that tend to reduce numbers of injurious insects. The losses from harmful insects occasioned each year to crops grown in the United States are about 3 billion dollars. The cotton-boll weevil causes a loss of more than 120 million dollars, the corn earworm nearly 100 million.

The control of insects, like the control of any plant or animal pest, is not entirely accomplished by direct attack, as by spraying or burning. In fact, these methods sometimes may be biologically undesirable and economically impractical. Tillage practices and other cultural methods developed jointly by the land manager and the biologist are often the best kind of insect control. In the Northern Great Plains, subsurface tillage by special implements leaves grain stubble or mulch on the surface of the soil to control wind erosion. At the same time it reduces the number of grasshoppers, for these insects lay their eggs in open, well-packed earth not accessible to them under such a mulch. Early planting of corn, plus fall plowing where erosion is not increased by such practice, combine to reduce greatly the damage by the European corn borer.

Burning, once thought to be a desirable insect control measure, is now acknowledged to do more harm than good. Protection from fire and grazing, furthermore, is one of the most effective means of assuring a crop of wild fruits from the hedge row or berry patch. Regular burning of fence rows, hedges and field borders tends to perpetuate annual weedy plants which in a few years' time would be replaced naturally by more desirable perennials if fire were prohibited. The insects inhabiting perennial vegetation nearly always are less injurious to crops, and in such habitats live many insects that

are predacious upon harmful species. We now know that permanent fence rows are about the only places on the farm where beneficial insects, as lady beetles, assassin bugs, and damsel bugs, can live undisturbed from year to year. Shrews also live in such woody cover, their diet consisting almost entirely of insects.

Thus proper attention to the parts of the farm or ranch pattern consisting of wild perennal vegetation—stream banks, hedges, field borders, revegetated gullies and so on—can reduce the populations of harmful insects as surely as the use of tillage, crop rotations, or other cultural practices. The war against insects we have always with us, and it is imperative that we pay particular attention to the way in which soil and moisture conservation practices, as well as all other land management measures, affect the numbers of injurious insects, so detrimental to the plants that provide us with food, fibre, oils, and other agricultural products essential to our welfare in times of peace or war.

Selective Service for Every Acre

In time of war it is more than ever necessary to prevent waste. This is true of time, steel, oil, rubber, manpower, food, fiber, transportation and, no less than all the rest, the land. The land is used wisely when it is made most productive without loss of the fundamental resource—the soil. Waste of land can be prevented by using seed, fertilizer, horsepower, and time, only on those areas that we know will produce high yields. It is inexcusable waste to seed, cultivate and fertilize badly eroded galled spots, highly alkaline areas, or depleted field borders that are inherently unproductive, and to plow into the creek bank where the field will tumble into the stream with the next freshet. It is also unwise to expect most profitable returns from cattle pastured on rocky outcrops, escarpments, sand dunes, in wet marshes or woodland. To try these things is to build a house upon quicksand—and as unreasonable and profitless. Yet there are for these areas profitable uses requiring little time, effort and cost, uses that will render them productive with as great return upon investment as can be realized on any acre of the farm.

These small areas, scattered over our farms and ranches—a quarter acre here, two acres there, or an occasional vast stretch of marsh, together with the borders of streams and ditch banks—add up to the surprising total of more than 33,000,000 acres of land throughout the United States, an area nearly equal to that of all New England. These lands erode, often more than others do, but they can be made to produce crops—crops of useful wild plant and animal life—the crops which comprise the "Selective Service" for these lands.

Farm areas useless for tilled crops, pasture or woodland provide a profit in furbearers easily harvested by the farm boy. Furbearers also yield fats for making explosives, furnish food, and contribute a share toward replacing the many million dollars worth of furs which can no longer be imported because enemies have blocked the usual sources of supply.

It is with this objective in mind that the biologist makes one of his real contributions to the management of agricultural lands. To maintain yields of crop lands he lends his special skill to assist in developing land management methods rendering crops least susceptible to injury by insects. He aids in preventing attempts to produce high yielding crops on unproductive sites, determines for such areas adapted crops of useful wild plants and animals, and develops management recommendations for producing them. Thus the marsh too wet for pasture yields muskrats and other fur bearers, the eroding area gives forth fruits for human as well as wildlife use, the pond supports an abundance of food fish.

Just as it takes more than one skill to make a plane or plan a campaign, so it takes more than one technique to manage land. The farmer, economist, agronomist, engineer, forester, range manager, biologist—all are needed to coax from the yielding land the food and fiber needed to fight this War and win the Peace. Together they can classify each parcel of the land for the use to which it is most neatly adapted, and accordingly manage it for the highest production at the lowest cost, in labor, money, and materials. And all of this not alone for today's extreme effort, but that the land be preserved as productive next year, next decade, next century, as it is today, so that we may prosper and our Nation endure.

Negro farmers have an important part in producing food and carrying on other war work. While the number of Negro farmers decreased by 16 percent from 1935 to 1940, the total acreage farmed by them increased by 18 percent during the same period.

There are now over 700,000 Negro farmers. Many members of these farm families are working in munition and other war plants near their farms. The crops they produce for sale and the food they produce for these war workers go a long way in helping our country to attain war goals.

As a part of their efforts to reach the war goals, Negro farmers are using conservation practices to help increase their farm production.—A. T. Semple.

NEGRO FARMERS PUT CONSERVATION ON PERMANENT BASIS

Jim Peyton, his niece, and his mother threshing crimson clover seed by hand to get seed for planting as a part of Jim's conservation plan.

BY T. L. ASBURY [1]

S. H. LEE, NEGRO COUNTY AGENT at Macon, Ga., has preached cover crops, rotations, pasture improvement, and other good farming practices to Negro farmers in Bibb County for 13 years.

Like other missionaries who have done good work, Lee found he had a lot of backsliders, but he saw his opportunity, when the Middle Western Ocmulgee River Soil Conservation District began operations in his county and several others in middle Georgia early in 1942. He knew that this was his chance to get good farming practices established on a more permanent basis because conservation plans were definite in nature and would be carried out over a period of years. Without delay he explained the district program to his group of Negro farmers and encouraged them to submit applications for district assistance. Then, working in close cooperation with George Seville, work unit leader of the Soil Conservation Service, he began developing conservation plans for the farms shortly after work in the district got under way.

The development of complete conservation plans—with individual farm maps showing the capabilities of the soil and the proposed land use program, along with a definite work schedule for setting up conservation practices year by year—is giving these farmers a new enthusiasm for their work and a new sense of the importance of their job.

[1] State conservationist, Soil Conservation Service, Athens, Ga.

County Agent Lee and Leonard Hart, examining growth of sericea in a field that provided three cuttings of hay in 1942 after being grazed until the last of March.

Even with definite conservation plans to serve as guides for their farming operations, some of Lee's followers occasionally slip back into careless habits: Wesley Hart, for example, left his crimson clover seed in a crib in the barn, without taking into consideration how far a mule's neck would stretch or the extra distance he could reach with his tongue.

When Wesley confessed to Lee and Seville during a visit to his farm that his mule had "got into" his crimson clover seed, Lee threw up his arms in a gesture of despair. "You mean your mule ate up your crimson clover seed!"

"Just about half of it, Mr. Lee," Wesley responded quickly, in an attempt to minimize the damage.

The look on County Agent Lee's face showed that the loss of this seed was no minor tragedy. Like the legendary horseshoe nail, it involved a series of complications, for in the carefully worked out plan for Wesley's farm, corn was to follow the crimson clover, and oats and lespedeza were to follow the corn, and cotton was to follow 2-year lespedeza in a systematic rotation. Now it looked as though the chain of events was about to be broken at the first link.

"If I don't have enough seed to plant that clover like I'm supposed to," Wesley announced, sensing the seriousness of the situation, "I'll buy me some more, so I can carry out my plan."

Away from the scene of the clover incident at the barn and down in the field where the rotation actually was being established, the outlook was much brighter. In two terrace intervals of the field, Wesley had an excellent growth of Korean lespedeza, which he said would be left there another year, in accordance with his plan. The clover, he explained with some hesitation, would be planted on the land he had in cotton, and would be followed by corn in the spring.

In addition to the annual lespedeza, he had good stands of sericea and kudzu, which were planned for the dual purpose of controlling erosion and providing a permanent source of feed. With 12 cows and an Angus bull, Wesley explained, he intends eventually to build up a beef herd on the farm, as he develops his pasture, hay, and other feed.

In a 1-acre garden patch, Wesley's wife, daughter, and grandchild were picking butterbeans, which he had planted at County Agent Lee's suggestion. He already had sold $50 worth of beans from the patch, Wesley said proudly—for this represented an entirely new source of income for the farm.

All in all, it looked as though things were going pretty well on Wesley's farm, when the lespedeza, kudzu, sericea, and butterbeans were balanced against the loss of the clover seed. But as he started to leave, Lee felt that one parting shot was needed to make sure no mule ever again would enjoy a meal of clover seed on Wesley's farm.

"You see Jimmy Peyton and get you some seed," Lee admonished as he drove off toward the next farm. "Jimmy's got plenty of seed, and he didn't leave it lying around where his mule could get it."

"I sho will, Mr. Lee," Wesley said seriously. "If I live and nothing happens, I sho will."

And it is a safe bet that Wesley will.

Leonard Hart, on the next farm, was in the garden picking okra to take to the market in town the following day. At $3 a bushel, he said, he had sold over $100 worth from an acre and a half plot, and he had sold lots of turnip greens, squash, collards, and other vegetables besides. Following Lee's suggestion he had planted squash this year in July for a late crop and with excellent results.

Leaving other members of his family to finish picking the okra, Leonard cut across a field to show his visitors his sericea, while he discussed other phases of his farm plan and the progress of his crops. The sericea had been planted 3 years before, also at Lee's suggestion; and in 1942 the district had furnished him 500 plants for an acre of kudzu which eventually would be expanded to 7 acres and would provide from his poorer land a permanent source of feed for his 7 cows.

Before he planted his sericea, Leonard said, he didn't have much of any hay, except peavine and Johnson grass "around about" in his fields. He grazed the sericea in 1942 until the last of March and then got three cuttings of hay during the summer. What this farmer liked best about sericea was the way it stood dry weather.

"The root is farther in the ground than the plant is tall," he explained, as he tugged at a foot-high stem that had grown since the last hay was cut. Finally

the stalk broke at the ground, but the root remained, proving his point about its depth.

"I'm going to put some acid on my sericea in the spring like it says in my plan," Leonard commented.

"If you read your plan again," Lee corrected, "you'll see it says three sacks of acid, not just *some*."

"That's right," Leonard agreed. "Three sacks, that's what it says."

At Amos Jones' farm, Amos told us how he got started with kudzu before his plan was made. Tax Collector Dunwoody had come by one day and they talked about a washed-away hillside that can be seen from the road. Dunwoody advised Amos not to try "to tend that land any more" and told him where he could get some kudzu vines to plant there. Amos followed his advice; he planted vines with two or three joints during a good season, "just like you would sweetpotatoes," and with good results.

"I find if you plow it up like you don't care nothing about it, it will grow better," he said.

Before he planted the kudzu, Amos had offered to give the hillside to his wife, suggesting that she get a bushel of oats and sow it there. Even if she didn't harvest any oats, he told her, she would get $10 worth of grasshoppers on the oats for her chickens to eat!

Now that Amos has a complete conservation plan for his farm, a lot more eroded land that he has been trying to "tend" is going into kudzu. Systematic rotations are being set up on the better land and with terraces and meadow outlets will help to keep the remaining areas of good land productive. The kudzu and other hay will provide feed for his cows, as well as protection against further damage to the land by erosion.

Pleasant L. Wesley, whose wife is a home demonstration agent, has made considerable progress in establishing his conservation program. When we saw his farm he had a large area planted to Korean lespedeza which had been sown on oats in the spring and was to remain on the land 2 years. The field was terraced, and a broad meadow outlet of sericea lespedeza extended down through a natural draw to a creek in the bottom. The bottomland was being cleared of brush and developed for permanent pasture. Up near the house on some of his most fertile land, he had planted 2 acres of kudzu that was making vigorous growth.

"The thing I like about kudzu," County Agent Lee commented, "is that once you get it established it's there to stay. I had some fine demonstrations of Austrian winter peas around through the county several years ago, but those farmers haven't planted any peas since. When you get kudzu or sericea on the ground, they stay there."

Probably the best example of the work that County Agent Lee and Conservationist Seville are doing with this group is on Jim Peyton's farm a few miles out from Macon. When Jim moved to the farm 30 years ago at the age of 18, the land was covered with virgin timber. Jim helped his father build the house where he lives today, and over a period of 14 years they cleared the trees from 53 acres of surrounding land.

Some of the trees were 3 feet in diameter, Jim told us. It wasn't easy work felling those big trees, sawing them into short lengths and splitting them into stovewood, but they managed to cut 100 to 150 cords a year to sell in town, which helped them to make the payments on the farm. They might have got a lot more for the wood as sawlogs, but they did not know much about timber values.

Jim Peyton and County Agent Lee display a 35-foot runner produced by a kudzu plant during the first growing season on severely eroded land.

They did not know either how quickly those steep slopes would be destroyed by erosion when the protective cover of trees was removed and the slopes were planted to cotton and corn year after year. Land that was virgin soil when they moved to the farm made good crops for 8 to 10 years, Jim recalls, but after that the yields were "mighty poor." Today much of the land is riddled with gullies that have cut deep into the subsoil.

Because he did not know anything about proper land use or conservation measures, Jim accepted this condition as inevitable. As the area of productive land diminished and his cotton yields decreased, he sought new sources of income. During the summer he peddled vegetables and in winter he sold stovewood to regular customers in town. For a number of years he has been cutting an average of 6 tons of hay a year from the campus of Wesleyan College in Macon to help carry his cows and workstock through the winter. On his regular trips to town twice a week to peddle vegetables and wood, he collects scraps to feed his hogs.

Jim has managed to provide a good living not only for himself and his mother, but for an aged uncle, and for two nephews and a niece who came to live with them when their mother died. Jim sent the two boys through high school and they are now sergeants in the army. His mother, his young niece, and Jim constitute the only labor on the farm, but last year he made a final payment of $200 on a $600 mortgage that was left on the farm at his father's death.

When Lee and Seville helped Jim work out a conservation plan for his farm, the conservation survey showed that of the 53 acres of cleared land, only 21 acres on the tops of ridges was suitable for cultivation. A 4-year rotation was planned, consisting of 5 acres of oats, followed by lespedeza for 2 years, 5 acres of cotton, followed by crimson clover, 5 acres of corn, with one acre set aside for garden and truck crops.

The remaining 32 acres of steep, severely eroded land is all being planted to kudzu, which eventually will provide sufficient hay and grazing to enable Jim considerably to increase his livestock. Good woodland management practices will be followed in the 50 acres remaining in woodland, allowing cordwood for sale each year and development of the stand for timber production.

As a result of the work done by County Agent Lee before the district operations began, Jim already had started planting crimson clover and vetch for winter cover and soil improvement. He saved enough crimson clover seed last spring to plant 5 acres of clover this fall, to be followed by corn next spring. He also sowed 5 acres to oats, on which lespedeza will be planted in the late winter or early spring, when his rotation will begin to take definite shape.

The district program, as County Agent Lee sees it, is providing an opportunity for getting good farming practices established on a permanent basis. It still takes some prodding here and there to get the conservation job done; but with good farming practices brought together in a unified program for each farm, he finds it a lot easier than it was before the district was organized in his county.

NEW DISTRICT WORKS TOWARD WARTIME GOALS

BY ROBERT E. BURGESS [1]

ON DECEMBER 8, 1941, the supervisors of the Claunch-Pinto Soil Conservation District, in central New Mexico, held their first meeting. On that day, the new soil conservation district, like the rest of the Nation, joined the fight. Since that day the supervisors and the people of this district have carried through with such vigor and with such deep faith in the wartime necessity of soil conservation that their district is now known as one of the most progressive of 33 such organizations in New Mexico.

The district was organized in the summer of 1941 after farmers in the Claunch-Pinto area had seen the results of terracing and contour farming in a nearby bean-farming area where dry farm conservation practices had increased bean yields an average of 82 pounds per acre.

This belief in conservation has taken concrete form. The five supervisors advanced $100 apiece, out of personal funds, to buy a tractor needed for construction of stock tanks, terraces, and other conservation structures in the district. In addition, these same supervisors took it upon themselves to pledge personal credit, in the amount of $200, for the purchase of additional equipment which is being rented at a nominal fee to farmers and ranchers building stock tanks.

To "get in the scrap," they took steps to furnish labor and transportation to any farmer who wanted to donate his scrap to the district. The scrap from the farms is hauled to junk dealers and sold. The money goes to the district treasury for needed

[1] Work unit leader, Southwest Region, Soil Conservation Service, Mountainair, N. Mex.

Contour cultivation and terraces hold moisture and curb wind erosion in the Claunch-Pinto soil conservation district. Through the use of such practices, some farmers have doubled their bean yields. This view was obtained on the R. E. Rayburn farm, near Eastwood, N. Mex.

equipment and expenses. The scrap goes to fight the war on many fronts.

Pooling of transportation is nothing new here. As soon as it became known that gasoline and rubber were critical materials, the supervisors began using one car to attend their monthly meetings. Living, as they do, in widely separated locations in the more than 500,000-acre district, they have worked out a plan whereby each supervisor is picked up in turn by the one who lives farthest from the headquarters.

Although the growing of pinto beans is the chief farming activity in this rolling country, some of the operators also run sheep and cattle on the piñon-juniper range lands adjoining their bean fields.

One of the priority jobs in the District Work Plan is the development of adequate stock water on range lands. Water has been a problem because wells must be 400 to 1,000 feet deep, and in many locations water is unobtainable even at these depths. Many farmers have hauled the precious liquid as far as 20 miles for domestic stock. Some ranchers have hauled water to isolated parts of their domains. The unfortunate consequences have been threefold—overuse of some locations; no use at all of other

Noel M. Hibler, secretary-treasurer of the district, standing beside one of the windmills which are symbolic of the importance of water in a semiarid country. Wells are deep—from 300 to 1,000 feet. Annual rainfall is but 15 inches. The district has built many stock water tanks for cooperators.

Crested wheatgrass, a year old, on the E. M. Stewart ranch near Claunch, N. Mex. The wheat grass was planted in rows and cultivated. In the fall of 1942 the field was combined for seed and, as the picture indicates, the wasted seed will make the field virtually a solid grass sod in another year.

areas; and the development of a one-crop farming system without advantage of livestock and facilities for marketing feed crops.

Formerly the practice of hauling water was very expensive and troublesome; now, with the shortage of rubber and gasoline, it is prohibitive. The supervisors are of the opinion that the district can contribute a great deal to the war effort by building stock dams in water drainageways to bring about better distribution of livestock and to make it possible to graze lands that could not be used before. This practice already has resulted in better protection for the land and increased production of beef and mutton for the fighting forces. Also, bean farmers faced with a labor shortage can turn those acres that otherwise would have lain idle to the production of forage crops.

Another significant activity of the district, pointed just now toward wartime production, is the reseeding program. Ben Roberts, vice chairman of the district, is somewhat of a pioneer in this work. Five years ago, he planted crested wheatgrass on one of his pastures. Roberts says that after 5 years of hard use by sheep and cattle, he still has an excellent stand of grass which the stock seem to prefer to grama grass.

After the district had been organized, and encouraged by Roberts' successful experience with reseeding, district farmers started out to reseed other abandoned farm lands that were out of production and were being seriously damaged by wind and water erosion. This work really got well under way last summer, and some 250 acres of crested wheat and other adapted grasses are now showing good stands and are on their way toward adding to livestock production in the district. For the first 2 years most of this acreage will be reserved for seed which will be used to enlarge the reseeded areas.

As J. W. Garrison, chairman of the board of supervisors, remarked, "There is a great need for this particular part of the program. A lot of land has been abandoned here in the district because of topsoil loss. We feel that if we can bring this land back into production of grass we'll eliminate a bad erosion problem and at the same time increase livestock production."

To get back to beans, the district is looking to terracing, contour cultivation, and strip cropping to do great things for this important crop. The area gets an average of about 15 inches of moisture each year, which means that every drop has to be conserved if beans are to be grown successfully. Then, too, with the knowledge that yields can be increased through conservation methods, the Claunch-Pinto farmers are looking forward to better incomes as a result of terracing and other practices. Right now, with bean prices up around $4.50 per hundred, a few more pounds per acre means real money. This season some farms yielded as high as 1,200 pounds per acre, with an average somewhere around 600 pounds.

The blending together of various agricultural programs through the medium of a soil conservation

district has proved profitable and helpful to Claunch-Pinto farmers. For example, in building terraces and other conservation structures, they are working closely with AAA and many are receiving conservation payments which help pay for the needed conservation work. Likewise, the Forest Service, which administers some of the range lands within the district, is cooperating with the district in its conservation work and is thus helping to prove the value of the soil conservation district mechanism.

The supervisors of this progressive district are J. W. Garrison, Benjamin H. Roberts, Noel M. Hibler, Sam Brown, and W. F. Jones. Not long ago they prepared a statement for the information of farmers and ranchers in the district. The quotation below is from this statement:

"We, as landowners, will be better able to accomplish greater conservation through an organization than through individual efforts. The value of the district to any interested person is simply this: It gives you an opportunity to study your land and your farm or ranch business in the light of all the recent improvements in agriculture."

Claunch-Pinto farmers and ranchers believe in their organization and in what they can accomplish with the district. Their program is launched and they are on their way toward their goals and the goals of the Nation at a time when better agriculture in the United States is needed more than ever before.

CROTALARIA PAYS OFF

BY T. S. BUIE[1]

FARMERS IN THE SOUTH are accustomed to thinking in terms of chemical fertilizers when they think of increasing crop yields. Should someone announce the discovery of a new fertilizer in which the vital ingredient, applied only once at the rate of 5 to 30 pounds an acre, would greatly reduce soil erosion, and at the same time increase the productivity of poor sandy land threefold or fourfold, farmers would want to know where this new wonder product could be bought. They would not care about the price per pound.

No such chemical compound is available, as we all know, but many southern farmers can get the same results by planting 10 to 15 pounds of scarified crotalaria seed per acre with corn, or by sowing 30 pounds of unscarified crotalaria seed on oats in late February or early March. The crotalaria will produce a seed crop; and the mature seeds if allowed to shatter out on the ground will give satisfactory volunteer stands following the last cultivation of the succeeding row crop, or after small grain is harvested the next spring. The volunteer crotalaria furnishes excellent ground cover during the late summer and fall, produces additional seed, and provides plant residue for considerable protection against erosion the following winter.

Successive volunteer crops of crotalaria gradually increase the productivity of the land without requiring any major changes in the cropping system or fertilizing practices. Nor is it necessary to make any changes in the land preparation or cultivation of the crops with which crotalaria is grown, except in the case of corn. With corn it is a good practice to cease cultivation when the crop is about waist high as this gives the crotalaria a chance to make a good growing start and does not appear to reduce the yield of corn.

Crotalaria lifted the average yield of corn from 10 bushels per acre to more than 25 bushels per acre, on this field in the farm of Tebe Shepherd, near Rockingham, N. C. Here is the owner (right) with W. B. Little, work unit conservationist of the Brown Creek soil conservation district, taking a look at a heavy growth of volunteer crotalaria which is being plowed under for soil improvement.

Farmers in the Coastal Plain section of several Southeastern States planted crotalaria in field trials in cooperation with the Soil Conservation Service in 1938. The plan of these simple trials included one plot in which crotalaria was planted in corn

[1] Regional conservator, Southeastern Region, Soil Conservation Service, Spartanburg, S. C.

rows between the hills of corn, a second in which alternate rows were planted to crotalaria, and a third plot in which every third row was planted to crotalaria. The crotalaria was planted on the same date as the corn so that it might produce a full crop of seed.

Cultivating the corn thinned the crotalaria considerably in the first plot as many small plants were covered by soil, but a sufficient number of plants survived to produce a fair seed crop. The other plots produced large yields of seed. The seed on all plots was allowed to shatter out and remain on the land. In 1939 volunteer stands were not as thick on the first plot as on the other two, but after the second year thick volunteer stands were established on all plots.

J. I. Lightfoot, of Troy, Ala., a cooperator of the Wiregrass Soil Conservation District, planted one of these field trials on a poor, sandy field. The volunteer crotalaria that grew in 1939 was turned under and followed by corn in the spring of 1940. The yield of corn was 21 bushels per acre, or approximately three times as great as the yield this sandy field was producing before the crotalaria was planted. Another volunteer crotalaria crop that grew after the last cultivation of corn in 1940 was turned under and followed by cotton in 1941. The cotton plants made vigorous growth and although the yield was low because of severe boll weevil damage, it was apparent that the cotton yield would have been satisfactory if the boll weevil had not interfered.

This field on the Lightfoot farm was planted to corn again in 1942 and a yield of 30 bushels per acre was obtained. Similar land nearby, where no crotalaria had been grown, produced approximately 10 bushels of corn per acre in 1942. The average corn yield for the sandy soils in this section seldom exceeds 10 bushels an acre.

Other farmers in the various States where these field trials were conducted, obtained results similar to those on Mr. Lightfoot's farm. Their crop yields have gradually increased from year to year on land where they planted crotalaria once and then went ahead with their normal cropping practices. They have been able to reduce the amount of nitrogen applied to crops following crotalaria and have not increased other fertilizers, although increased amounts of phosphate and potash might have been profitable.

These better yields of corn following crotalaria, such as were obtained by Mr. Lightfoot and other farmers in the field trials, may appear low to farmers accustomed to yields of 40, 60, or even 80 bushels of corn per acre. It must be remembered, however, that these yields resulting from the use of crotalaria are approximately double the average corn yield in most of the Southeast. In fact, the average yield of corn in some Southeastern States is far below the cost of production.

The Florida agricultural experiment stations pioneered in research with crotalaria. The crop was introduced in that State several years ago, and in the experimental work that followed the new crop was found quite valuable as a soil builder. At the Citrus Experiment Station at Lake Alfred, crotalaria and several other cover crops were grown in a young orange grove that was planted in 1925. The increase in the cross section area of the trunks of the orange trees during the first 7 years, 1925 to 1931, under the different cover crop treatments was as follows: *Crotalaria striata*, 18.9 square inches; Natal grass, 17.8 square inches; beggarweed, 16.9 square inches; velvet beans, 15.6 square inches; clean culture, 13.3 square inches.

The total yield of fruit resulting from the different cover crop treatments during the 4-year period, 1928 to 1931, was as follows: *Crotalaria striata*, 169.5 boxes; Natal grass, 157.2 boxes; beggarweed, 135.4 boxes; velvet beans, 114.7 boxes; clean culture, 40 boxes.

Likewise, crotalaria ranked above a number of other cover crops in a 2-year rotation with corn and sweetpotatoes at the Florida Agricultural Experiment Station at Gainesville. The average annual acre yields of sweetpotatoes, over a period of 4 years, following different cover crops were as follows: Florida pusley, 20.8 bushels; beggarweed, 23.4 bushels; velvet beans, 26.9 bushels; cowpeas, 27.9 bushels; and *Crotalaria striata*, 38.9 bushels. The 3-year average acre yields of corn following these cover crops were: Florida pusley, 8.7 bushels; beggarweed, 12 bushels; velvet beans, 16.8 bushels; cowpeas, 14.2 bushels; *Crotalaria striata*, 16.6 bushels.

Since this experimental work, crotalaria has become the most important soil-conserving legume grown in several north-Florida counties, especially in Madison and Suwannee.

As a direct result of a few field trials in the former erosion-control demonstration project at Gainesville, Ga., in which crotalaria was seeded on small grain in the spring of 1938, several hundred acres of grain land was seeded to crotalaria in the spring of 1941. Since then this practice has spread rapidly in the Upper Chattahoochee Soil Conservation District around Gainesville. Many farmers in the district have no equipment for harvesting lespedeza and other kinds of seed, but usually they harvest by hand sufficient crotalaria seed to plant whatever acreage they need on their farms. This makes it a particularly valuable crop for small farms without

J. I. Lightfoot, Troy, Ala. (right), tells M. B. Smith, work unit conservationist of the Wiregrass soil conservation district, that crotalaria over a short period of years jumped his corn yield from 8 bushels per acre to from 25 to 30 bushels. He first planted crotalaria in 1938 and each year since the crotalaria has come along with a good volunteer stand.

such equipment.

In the Richmond County work unit of the Brown Creek Soil Conservation District in North Carolina, the acreage of crotalaria has been expanded from 160 acres in 1936 to approximately 30,000 acres in 1941. W. B. Little, work unit leader of the Soil Conservation Service, assigned to Richmond County, reports as follows on a poor sand hill farm rented by Tebe Shepherd from Dr. F. B. Garrett in the fall of 1935.

Shepherd helped the former tenant harvest corn from 6 acres of sandy land the first autumn, and he said that they put all the nubbins from the 6 acres in two cotton sacks which then were not quite full. This field was planted to wheat in the fall of 1935 and fertilized with 75 pounds of nitrate of soda per acre in the spring of 1936. The yield of wheat was 1½ bushels per acre—4 bushels less than the amount of seed wheat planted on the 6 acres. At Little's suggestion, Shepherd planted *Crotalaria striata* on this field in 1937 and turned it under for corn in 1938. Corn, with 100 pounds of mixed fertilizer per acre, made 27.4 bushels per acre. Volunteer crotalaria that grew following the last cultivation of corn was turned under in the spring of 1939. The corn that was planted was not fertilized, yet it made 16 bushels per acre.

In 1940, 1941, and 1942, this same field was planted to wheat and fertilized with 75 pounds of nitrate of soda per acre each year. Good stands of crotalaria were obtained after wheat was harvested. Acre yields of wheat were: 1940, 11 bushels; 1941, 17.5 bushels; 1942, 21 bushels. These remarkable increases in yields were obtained with unusually light applications of fertilizers. It is almost certain that even better results would have been obtained on this poor sandy land if moderate amounts of phosphate and potash had been applied.

Across the line in South Carolina, crotalaria is proving to be a most dependable and effective soil-conserving crop for the sand hills section. David L. White, of McBee, S. C., is growing crotalaria extensively as a soil-improving cover crop in peach orchards and on cropland. He says his peach trees live longer, produce better yields, and remain in better condition where crotalaria is used as a cover crop than on similar soils without it.

The use of this legume as a soil-conserving crop has been restricted to some extent because of the possibility of livestock poisoning where volunteer crotalaria plants are harvested with such annual hay crops as soybeans and cowpeas. *Crotalaria spectabilis* is known to be toxic when eaten in considerable quantity. There have been instances where the death of livestock was attributed to grazing green crotalaria on cropland in which cattle were pastured after corn was harvested in the fall.

On the other hand, it was a common sight during the fall of 1942 in Florida, Georgia, and Alabama, to see cattle grazing in pastures where *Crotalaria spectabilis* was in full bloom. No harmful effects were reported. In fact, several farmers in Madison and Suwannee Counties, Fla., say they are getting more and better pasture grass where it is growing with crotalaria.

Numerous examples of farmers finding crotalaria a valuable soil-building crop could be cited, but its use has not spread as rapidly as its performance would justify. The next few years, however, should see a great expansion in crotalaria acreage. For one thing, the soil conservation districts, especially those located in the Coastal Plain section of the Southeast, are emphasizing the value of crotalaria. This past fall a number of districts urged farmers to make a special attempt to harvest enough seed to increase their acreage. Then, too, the effect of war in curtailing nitrogen supplies for commercial fertilizer will make it almost imperative for farmers to turn to crotalaria and other soil-building legumes if they wish to maintain or improve their yields of corn, wheat, and other crops.

Crotalaria is well adapted to agricultural conditions in the Southeast. There is a vast acreage of poor land that could be improved with the use of crotalaria, and moreover the percentage of land planted to row crops with which crotalaria could be grown to an advantage is very high. When a good crop of seed is produced and allowed to remain on the land, crotalaria comes in as a volunteer cover.

BOOK REVIEWS AND ABSTRACTS

by Phoebe O'Neall Faris

FOOD: A WEAPON FOR VICTORY.

By Bertram Fowler. Boston, 1942.

There is one thing that can be said of the American people: When we see with clarity that we have been dolts and dotards, living in a fool's paradise, then we move all heaven and earth to make up for it. Sometimes we plunge into another dilemma-with-horns, occasionally through exuberance but more often because we do not see our objective from all sides at the right time. The time has come now, if it is ever coming, when we had better go into a huddle, one-hundred-and-thirty-million strong, and think with all our national brain power about this food-as-a-weapon business. Bertram Fowler's book, the first to deal with the problem of food relief for Europe after the war is won, is extraordinary for concreteness and the courage of conviction. Two readings are recommended by the reviewer, with an interval of at least two weeks between to give the thinking machinery a chance to get into position for broader concepts.

Mr. Fowler, one of the editors of Free America, apparently has thought deeply on his subject and has done a tremendous amount of research to determine whether or not his scheme can be carried out. His book propounds a definite plan for formation of a United Nations post-war famine relief organization, to be headed by a Coordinating Committee composed of members appointed by each and every one of the Allied Nations. It is the *United Nations* motif that gives the plan its power as a weapon for peace.

The United Nations famine relief organization would be empowered to purchase immense stocks of food and medical supplies, and seeds and farm machinery, from all producing countries, and arrange for their distribution in famine areas immediately upon deliverance by Allied armies. The stake that agriculture will have in any such relief program needs no emphasis. The strain on the agricultural lands of the United States will be tremendous even though feeding hungry Europe immediately after the war should turn out to be a United Nations job. Mr. Fowler's idea is that agricultural experts should be summoned at the very beginning to provide information concerning every producing nation of the world and to plan crop shifts and conservation methods for raising vitamin-rich and protein-rich foods with the least possible damage to the soils.

The author's discussion of the probable impact upon agriculture of a United Nations famine relief program deserves considerable attention. He is of the opinion that it would bring balance of agricultural markets, of land use and production; it would bring expansion of newer and better curing and processing methods, with dehydrating units moving about the country to preserve foodstuffs often wasted for one reason or another.

The plan set forth in this book already is receiving a great deal of attention, and although it may not be perfect in detail it nevertheless is something definite and certainly it stimulates post-par planning toward goals we all want to attain. It is thought by many, the author of his book in particular, that if we begin now to accumulate an international arsenal of food stores so that there need be no delay in feeding the hungry people of Greece, Poland, Yugoslavia, Belgium—all helpless small countries that now suffer under the Nazi heel—if we do this now, and let them know we are doing it, it may shorten the war and have tremendously important effects upon after-war discussions.

There is no doubt that Mr. Fowler's famine relief plan would involve some seemingly impossible accomplishments—as, for example, the problem of transportation and shipping. But, in view of the fact that his suggested program is built upon the theory of internationalism it is a good program and it ought to work for much good, if it works at all, not only for suffering Europe but also for the cause of the United Nations and for world enlightenment. It ought to, but will it? Do we know the people of Europe well enough to go to such lengths to relieve their suffering? In their bitterness and misery, how will they react to "policemen bearing gifts?" These are some of the questions we must ask ourselves during the second reading of Bertram Fowler's book.

FARM DRAINAGE

(*Continued from p. 199*)

merly at Fowler, Indiana, and Henry M. Luebcke from Lagro, Indiana—have been in England since August, assisting with this work. Reports from these engineers indicate that the program is progressing well and benefits are materializing.

A quotation from the message of British Minister of Agriculture, delivered in the House of Commons March 18, 1942, is as follows: "Every kind of machinery upon which we can lay our hands is being used for drainage purposes to try to diminish the need for labor * * *. Unfortunately there are thousands of miles of ditches which are not doing their jobs, and in consequence tens of thousands of acres are waterlogged and cannot produce maximum crops. Ditches are the key to the whole drainage problem, and I want farmers, landowners, farm workers and my committees to make it their watchword to fight to the last ditch."

U. S. GOVERNMENT PRINTING OFFICE: 1943

For REFERENCE

Compiled by ETTA G. ROGERS, Publications Unit

Field offices should submit requests on Form SCS–37, in accordance with the instructions on the reverse side of the form. Others should address the office of issue.

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[1] From Superintendent of Documents, U. S. Government Printing Office, Washington, D. C.

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As though made for the eyes of a Belshazzar, this ominous camera-message to the Axis tells of the concerted might of an aroused democracy.

Here in close companionship are symbols of sure triumph by the United Nations. Here are suggested the efficient, modern methods of free farmers—stripped fields that are pathways to high production. Here is a home with vegetable garden—and remember that, however humble it may be, the home of the American soil tiller is his "castle." Here spread proud wings to blazon the challenge of the fighting western industrialism.

These three must inevitably prevail—free farms, free factories, and free men. In the air, on the land, they are writing the early doom of aggressor Nations.—W. B.